STUDENTS

To be successful on the Living Environment Regents you must be able to apply the concepts you have learned over the year. The exams and answers presented here provide you with about 300 questions that will test your understanding and your ability to apply your knowledge of biology. It is not enough to just do the practice exams before the Regents, you must be committed to seriously reviewing each answer and explanation until you feel confident of the concept.

Planning for the Regents begins perhaps a month or two months before the exam date. You do not want to wait until the last minute and cram. You should work a set of questions daily (about 15 to 20), going over the answers and reviewing the concepts involved. Star the questions you do not feel totally confident in and go back to those for more review and make notes in your margins.

If you work hard and do the exams carefully, review the answers and revisit areas of concern in a timely fashion, you should have success on the Regents.

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LIVING ENVIRONMENT REGENTS

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Part A

Answer all questions in this part. [30]

***Directions* (1–30): For *each* statement or question, write in the space provided the *number* of the word or expression that, of those given, best completes the statement or answers the question.**

1. Producers are generally found at the beginning of a food chain. Which statement best explains why this is true?
(1) Producers are usually smaller in size than consumers.
(2) Producers do not rely on other organisms for food.
(3) There are always more consumers than producers in food chains.
(4) Consumers are always more complex organisms than producers. 1_____

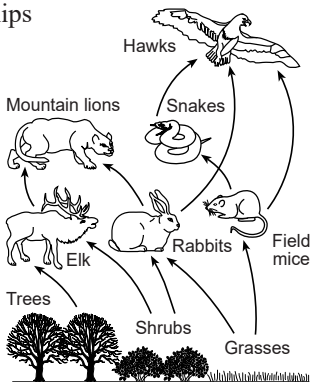
2. A lion cub resembles its parents because it inherits genes that produce
(1) DNA identical to all of the DNA found in both parents
(2) proteins identical to all of the proteins found in both parents
(3) ATP identical to some of the ATP found in each parent
(4) enzymes identical to some of the enzymes found in each parent 2_____

3. If body temperature is too high, some blood vessels increase in size and sweat glands will excrete sweat, resulting in a lower body temperature. These changes are an example of
(1) a learned behavior
(2) feedback mechanisms
(3) an inherited disorder
(4) genetic mutations 3_____

4. A farmer grows beans that he sells to local markets. Over a period of 40 years, the farmer has identified the plants that produced the most beans and only used those beans to produce new plants. This procedure is part of the process of
(1) selective breeding
(2) genetic engineering
(3) replication
(4) cloning 4_____

5. Although we rely on coal, oil, and natural gas to produce energy, some environmental scientists have proposed that we use less fossil fuel. One reason to support this proposal is to
(1) enable us to preserve rain forests in tropical areas
(2) help us to reduce the production of carbon dioxide gas
(3) allow us to decrease the use of fertilizers on crops
(4) encourage us to end research on wind and water power sources 5_____

6. The diagram represents relationships in an ecosystem. What is the primary source of energy in this environment?



(1) cellular respiration in the plants
(2) energy from minerals in the soil
(3) fossil fuels
(4) solar energy

6_____

7. Research has shown that treadmill training increases the number of certain energy-releasing structures in the brain cells of rats.
The cellular structures referred to in this study are most likely

(1) mitochondria (3) vacuoles
(2) nuclei (4) ribosomes

7_____

8. Which process must first take place in order for the proteins in foods to be used by body cells?
(1) digestion (2) storage (3) synthesis (4) excretion 8_____

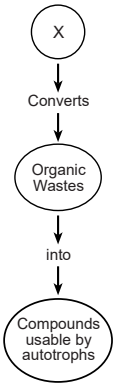
9. Which statement is characteristic of reproduction in humans?
(1) The reproductive cells of males and females differ in chromosome number.
(2) Males and females produce gametes in the ovaries.
(3) Males and females produce the same number of gametes.
(4) The reproductive cycles of males and females are regulated by hormones. 9_____

10. Which row in the chart below represents the most likely changes in the atmosphere due to widespread deforestation?

Row	Oxygen Concentration	Carbon Dioxide Concentration
(1)	increases ↑	increases ↑
(2)	increases ↑	decreases ↓
(3)	decreases ↓	increases ↑
(4)	decreases ↓	decreases ↓

10_____

11. The accompanying chart represents some of the events that occur during the cycling of nutrients in an ecosystem.

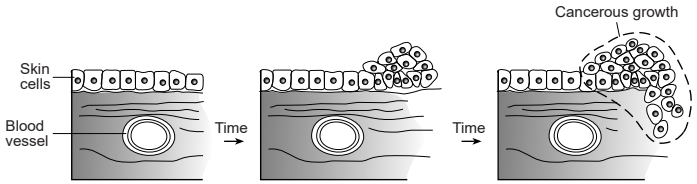


Which organisms would most appropriately complete the chart when written in the circle at *X*?

(1) producers (3) carnivores
(2) herbivores (4) decomposers

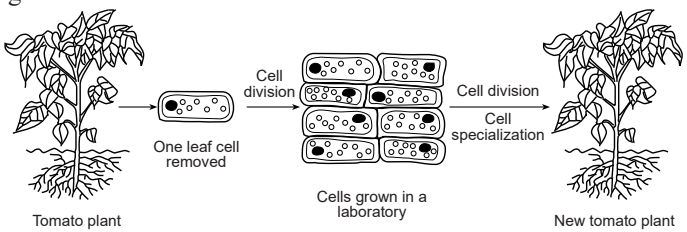
11_____

12. The diagram below represents the formation of a cancerous growth.



Which statement best explains the events represented in this diagram?
(1) A gene mutation caused the cells to become muscle cells.
(2) The growth resulted from the introduction of a vaccine.
(3) A gene mutation caused abnormal mitotic cell division.
(4) The growth resulted from uncontrolled meiotic cell division. 12_____

13. A standard laboratory technique used to produce a new plant is represented in the diagram below.



This technique is best identified as
(1) gene alteration (3) replication
(2) selective breeding (4) cloning 13_____

14. An example of competition between members of two different species is
(1) mold growing on a dead tree that has fallen in the forest
(2) purple loosestrife plants growing in the same wet areas as cattail plants
(3) a coyote feeding on the remains of a deer that died of starvation
(4) two male turkeys displaying mating behaviors to attract a female turkey 14_____

Part C

Answer all questions in this part. [17]

Directions (56–72): Record your answers in the spaces provided.

Base your answers to questions 56 through 58 on the data table and on your knowledge of biology.

In 1987 an agreement was reached called the Montreal Protocol, which limited the world's production of chemicals that could damage the ozone shield.

Source: https://ozonewatch.gsfc.nasa.gov

Changes in Size of the Ozone Hole

Year	Ozone Hole Area (million km^2)
1980	3.3
1985	18.8
1990	21.1
1996	26.9
2000	29.9
2005	27.2
2010	22.6
2017	19.6

56. Identify *one* risk associated with the destruction of the ozone shield. [1]

57. Using evidence from the data table, explain whether or not the Montreal Protocol has been effective. [1]

58. Describe *one* possible *negative* consequence that is important to consider when an international agreement such as the Montreal Protocol is adopted. [1]

Base your answers to questions 59 through 62 on the information below and on your knowledge of biology.

Fungicides and Bumblebees

Source: Adapted from https://polinizador.files.wordpress.com/2011/03/img670-6-18-07.jpg

Bumblebees are extremely important in agriculture. They pollinate many flowering plants, including food crops such as tomatoes, pumpkins, and blueberries. The bees gather wet, sticky pollen from flowers and take it to their nests. Fungi, present on the pollen, keep it from spoiling. In the nest, bumblebee larvae feed on both the pollen and fungi.

Through his research, Dr. Shawn Steffan discovered that the stored pollen and nectar that bumblebee larvae feed on is rich in yeast, a type of fungus. Based on this observation, he proposed that the application of fungicides, chemicals that kill fungi, on agricultural crops could affect the quality of bumblebee food and ultimately the health of bumblebee colonies. He hypothesized that if the fungi associated with the pollen suffer, then the bumblebee larvae will also suffer.

Dr. Steffan designed an experiment in which five colonies of bumblebees only fed on flowers treated with fungicides. In five other colonies, the bumblebees only fed on flowers that were free of fungicides. At the conclusion of the experiment, the control-bee colonies averaged about 43 individuals. The colonies that fed on flowers with fungicides (and no fungus) averaged only about 12 individuals.

59. Using information from the reading, explain how the results of the experiment support Dr. Steffan's hypothesis. [1]

_____

_____

60. Dr. Steffan proposed that one way to protect the bees might be to only spray agricultural crops when they were not flowering. Explain how this would prevent harming bumblebee larvae. [1]

_____

_____

61. In addition to the use of pesticides, studies also show that bee species inhabiting smaller geographic areas are more sensitive to changes in climate. Explain how climate change could have a greater impact on bee species inhabiting smaller geographic areas than those inhabiting larger geographic areas. [1]

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_____

62. Explain why it is important to preserve bumblebee populations. [1]

_____

_____

63. Scientists build models based on what they know from previous research to develop testable hypotheses. Scientists Watson and Crick first constructed an incorrect triple-helix model of DNA with the bases (A, T, C, G) arranged on the outside of the molecule. Explain why their triple-helix model was valuable even though it was not correct. [1]

_____

_____

64. State *one* reason why a human heart muscle cell would probably contain a higher proportion of mitochondria than a skin cell. [1]

_____

_____

65. Phytoplankton are photosynthetic organisms that live in aquatic environments. Although microscopic, their vast numbers provide a plentiful resource for many aquatic food webs. Explain why populations like phytoplankton are required to sustain an aquatic food web. [1]

_____

_____

Base your answers to questions 66 through 68 on the information below and on your knowledge of biology.

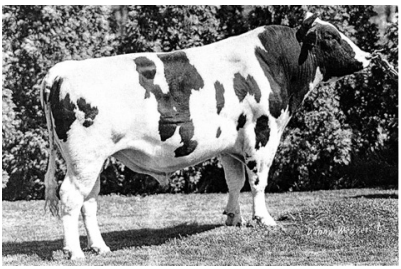
How One Bull Cost the Dairy Industry $420 Million

It all started with a bull named Chief. He had 16,000 daughters, 500,000 granddaughters, and 2 million great-granddaughters. Today, 14% of the genes present in Holstein dairy cows came from Chief.

Chief was popular because his daughters were fantastic milk producers. The problem is, he also had a single copy of a deadly mutation. The mutation spread undetected through the Holstein cow population and was responsible for the spontaneous death of 500,000 fetal calves. The loss of these calves cost the dairy industry $420 million.

Over the past 35 years, using Chief's sperm, instead of sperm from an average bull, resulted in $30 billion in increased milk production. Due to Chief's genetic contribution, the average dairy cow today produces four times more milk than a dairy cow in the 1960s.

Chief embodies the trade-offs associated with selective breeding.



Chief

Source: https://www.progressivedairy.com

66. Explain why using Chief to produce so many offspring is an example of selective breeding. [1]

_____

_____

67. Explain how the use of Chief to produce offspring had both advantages and disadvantages. [1]

_____

_____

68. Explain how genetic engineering could be used to improve the chance that more of Chief's offspring would survive. [1]

_____

_____

Base your answers to questions 69 through 72 on the information below and on your knowledge of biology.

The Tuskless Female Elephants of Gorongosa National Park

Elephants are large mammals that live in parts of Africa and Asia. They typically have tusks which are a pair of elongated teeth that the animals use to strip bark off of trees and dig holes to obtain water and minerals. Tusks are also used by males when they compete with each other to impress females during the mating season. Males born without tusks are at a high risk of being severely wounded during these competitions.

In several regions in Africa, elephants have been killed for their ivory tusks. The ivory can be sold for large sums of money, even though the sale of ivory is illegal in many parts of the world. During a 15-year civil war in Mozambique, many large-tusked elephants in Gorongosa National Park were killed and their ivory sold to buy arms and ammunition. The elephant population decreased during the war from over 2000 individuals to only a few hundred. Female elephants that had no tusks (an inheritable trait) made up only about 6% of the entire population before the war began.

When the war ended in 1992, the wildlife in the park was better protected against poaching. The elephant population has recovered fairly well, but a significant change has been noted: The tuskless female elephants that survived the civil war now make up more than 50% of the older female population in the park. About 33% of the female offspring that were born after the war are also tuskless. No tuskless males have been seen.

69. Explain how an elephant without the ability to grow tusks could be born into a population of elephants that all have tusks. [1]

_____

_____

70. At the start of the civil war, only about 6% of the female elephants had no tusks. Explain why over one-half of the females that survived the war had no tusks. [1]

_____

_____

71. Explain why so many (33%) of the female elephants born in the years after the war have no tusks. [1]

_____

_____

72. Even without poaching being a factor, explain why tuskless males are rarely seen. [1]

_____

_____

Part D

Answer all questions in this part. [13]

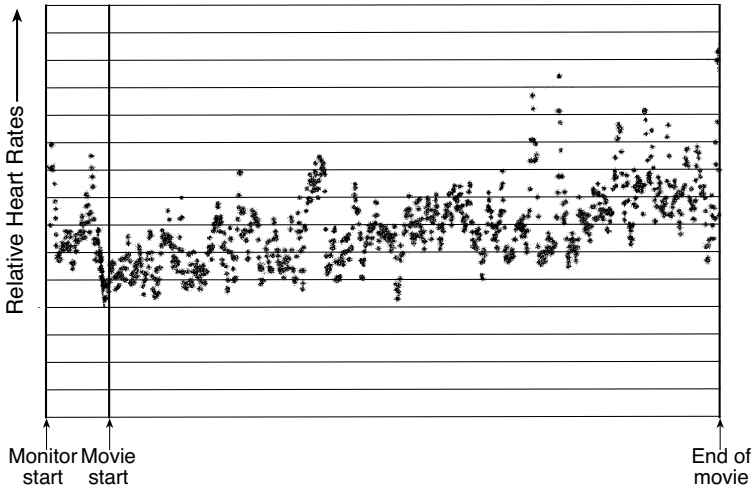
***Directions* (73-85): For those questions that are multiple choice, record on the space provided the *number* of the choice that, of those given, best completes each statement or answers each question. For all other questions in this part, follow the directions given and record your answers in the spaces provided.**

Base your answers to questions 73 and 74 on the information below and on your knowledge of biology.

Before watching a scary movie, the members of a theater audience agreed to have their heart rates monitored. They were asked to sit in silence for 10 minutes before the film began. The movie was then shown from beginning to end.

The scatter plot below summarizes the data collected by all of the heart monitors from ten minutes before the start of the movie to the end of the movie.

Scary-Movie Heart Rates



Source: http://www.theguardian.com/film/filmblog/2014/sep/01/watched-horror-film-heart-rate-monitor-as-above-so-below

73. In this experiment, the dependent variable is the
(1) heart rate of the audience members
(2) scene being viewed by the audience
(3) amount of time the movie played
(4) number of viewers with heart-rate monitors 73_____

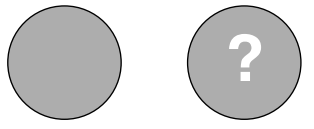
74. Which is a possible hypothesis most likely being tested in this experiment?
(1) Silence in a theater increases the heart rates of the audience members.
(2) The length of a movie causes changes in heart rate.
(3) Do heart rates increase when watching scary movies?
(4) Watching scary movies will increase the heart rates of audience members. 74_____

75. A student filled two Petri dishes with a clear gel made with corn starch. He was given two unknown solutions (*A* and *B*) and was asked to determine which solution contained a chemical that digests starch.

Using a clean cotton swab, he dipped it into solution *A* and wrote a "?" invisibly onto the gel in one of the Petri dishes. He repeated the same procedure on the second Petri dish with a clean cotton swab he dipped in solution *B*.

Twenty minutes later, he added starch-indicator solution to the surface of both Petri dishes. The surface of the Petri dish with solution *A* added turned completely blue. Most of the surface of the Petri dish to which solution *B* was added was blue, except the "?" was clear. The results are illustrated to the right.

Petri Dishes With Starch Gel After 20 Minutes



Petri dish swabbed with solution A | Petri dish swabbed with solution B

An observation that supports the student's conclusion that solution *B* contained a chemical that digests starch is that the

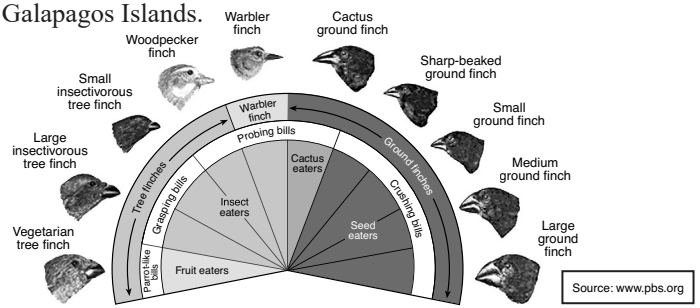
(1) damp cotton swab absorbed some of the starch where it touched the gel

(2) starch indicator changed the color of the gel to blue

(3) area swabbed with solution *B* remained clear

(4) chemical in the starch indicator reacted with the chemical in *B* 75_____

Base your answer to question 76 on the information below and on your knowledge of biology. The diagram shows variations in the beaks (bills) of some finches on the Galapagos Islands.



The photographs of four different finch species that are found in the Galapagos are shown below.

A B C D

Source: *Biology,* Mader, Sylvia, McGraw-Hill, Boston, 2007, p.287, and Wikipedia

76. Which row in the chart below correctly identifies one of these finches?

Row	Finch	Beak Characteristic	Food Source	Species
(1)	A	Probing	Fruit	Large ground finch
(2)	B	Probing	Insects	Warbler
(3)	C	Parrot-like	Seeds	Cactus finch
(4)	D	Crushing	Fruit	Small ground finch

76_____

June 2018
Part A

1. 2 Producers utilize energy from the Sun to carry out photosynthesis. This process produces organic compounds, like glucose, that plants use to carry out life functions, therefore not requiring other organisms for food.

2. 4 Genes provide the code for the production of proteins such as enzymes. When genetic information is passed from the lion parents to cub offspring, some of the information may code for identical enzymes like that of the parent.

3. 2 Feedback mechanisms allow organisms to regulate life functions through the use of signals and metabolic responses. When the body temperature becomes too high, blood vessel size increases and sweating occurs, resulting in a lowering of temperature to normal levels.

4. 1 Selective breeding is a process where organisms with desirable traits are bred to produce offspring with those characteristics. Productive beans plants are bred with each other to produce new plants that maintain and improve the bean plant's productivity.

5. 2 Burning of fossil fuels releases carbon dioxide into the atmosphere. Higher levels of carbon dioxide in the atmosphere has been linked to increased global temperatures which is a concern for environmentalists.

6. 4 In this ecosystem, the primary source of energy is solar energy from the Sun. This energy is converted to the chemical bond energy of organic compounds, like glucose, by autotrophs or producers through the process of photosynthesis.

7. 1 Mitochondria are cellular structures that are sites of cellular respiration, an energy producing process. The energy molecule ATP is synthesized as a result of this process.

8. 1 Proteins are large, complex molecules that must be broken down by digestion into smaller building blocks called amino acids. Amino acids are then small enough to pass into the bloodstream and into cells for necessary metabolic function.

9. 4 Human reproduction is regulated and coordinated by hormones in both males and females. Testosterone is a male hormone responsible for development of male sex characteristics. Estrogen and progesterone aid in the regulation of the uterus and the female menstrual cycle.

10. 3 Deforestation would result in decreased levels of oxygen as there are fewer trees carrying out photosynthesis which releases oxygen gas. Decreased photosynthetic activity would reduce the amount of carbon dioxide being taken out of the atmosphere, thus increasing its concentration. Also, if the deforestation involved the burning of trees, this would also add carbon dioxide to the atmosphere.

11. 4 Decomposers are organisms, such as bacteria or fungi, which recycle organic wastes into a usable form. These recycled compounds can then be utilized by autotrophs for growth and metabolic function.

12. 3 Cancer is defined as abnormal cell growth. Mitosis creates new cells through a cell division process. In the diagram, a cancerous growth would represent the uncontrolled mitosis or cell division over time.

13. 4 Cloning is a process where an identical genetic organism is produced. In the diagram, a tomato cell with a complete set of genetic instructions is stimulated to divide and specialize into a new tomato plant, identical to the original plant.

14. 2 Purple loosestrife is an invasive plant species that has been introduced into wetlands where native cattails inhabit. The purple loosestrife competes for nutrients with the cattails and may eventually take over the wetland as it has no natural enemies to check its population.

15. 2 All body cells contain identical genetic information, however different sets of genes may be activated or expressed in different cells. These expressed genes will determine the structure and function of each of the different types of body cells.

16. 2 The egg which is released from the ovary (*A*) is fertilized within the fallopian tube or oviduct (*B*). Once fertilized, the zygote begins to divide and move to the uterus (*C*) to develop.

17. 3 Asexually reproducing ameba produce genetically identical offspring, so variation would most likely be a result of random mutations that occur within the ameba population and are passed on.

18. 1 Organ and tissue development in a zygote is achieved through the processes of mitosis and differentiation. Mitosis or cell division allows for the growth of the organs or tissues. Differentiation occurs when particular gene sequences are activated in the cell, directing structure and function for that organ or tissue.

19. 4 Farming practices which altered the ecosystem of the prairie caused a series of events that created both ecological as well as health concerns for residents of the southern prairies. Human practices often have negative unintended consequences.

20. 3 Pollutants, including sulfur and nitrogen compounds, enter the atmosphere from industry and vehicular combustion. Prevailing midwest winds move this pollution to the northeast. These pollutants alter the pH of rain that falls in the northeast, damaging ecosystems and populations such as the sugar maple.

21. 1 The male testes produces and stores sperm. The vas deferens and urinary duct inside the penis provide a means to deliver the sperm internally into the female body.

22. 1 The biological technique in this diagram, genetic engineering, allows for a section of DNA from a human to be inserted into the DNA of a bacteria. The bacterial DNA will replicate and then the cell divides during cell division producing new bacteria with human DNA sections. All new bacterial cells will produce the human protein coded for in that DNA segment.

23. 3 A complete set of genetic instructions would be found in letter *C*, the zygote. Each gamete or sex cell from female(*A*) and male(*B*) contain half of the full chromosome number and combine to create a full set of chromosomes with all the genetic information needed for development.

24. 4 Organisms must be able to reproduce and pass on genetic instructions to their offspring to maintain the species. All five organisms shown are able to reproduce and pass on traits.

25. 4 Mistletoe acts as a parasite when it takes water and nutrients from its host tree. The mistletoe benefits from this relationship whereas the host tree may be harmed or compromised.

26. 2 Non-native species often outcompete and take over native habitats. Imported rabbits had no natural predators or diseases to limit their population growth and overpopulated Australia. The use of the myxoma virus was an attempt to control the overpopulation of introduced rabbits.

27. 3 Carbohydrates can be digested into simple sugars such as glucose, which can provide the chemical energy needed to produce the energy molecule, ATP.

68. Acceptable responses include, but are not limited to:
The lethal gene could be replaced with a healthy one.
or Genes that increase the risk of death could be detected and removed.
or The lethal gene could be repaired.
or Remove the deadly mutation.
or Fix the fatal gene.

Explanation: Genetic engineering involves the manipulation of a genetic sequence through the addition of a favorable gene or the repair of a harmful one. In the case of Chief and his offspring, repairing the mutation would reduce the risk of spontaneous fetal death.

69. Acceptable responses include, but are not limited to:
The baby elephant may have had a mutation that kept it from growing tusks.
or Both parents had a recessive gene for no tusks.
or Gene recombination/meiosis may have produced an embryo with no genes for growing tusks.

Explanation: The inability to grow tusks may be a genetic mutation expressed in the baby elephant. A mutation is a sudden change in the genetic code. The above answers give other possible pathways for the expression for growing no tusks.

70. Acceptable responses include, but are not limited to:
Many elephants died from poaching during the war. Almost all of them had tusks. This means most of the surviving elephants had no tusks, so they made up a larger part of the surviving population.
or Most of the elephants with tusks were killed, so most of the survivors did not have tusks.
or Elephants with tusks were killed by poachers.
or Most of the survivors did not have tusks, so they were of no value to poachers.

Explanation: Elephants with tusks were poached during the war for their ivory. Those females without tusks had a better chance of not being killed, and therefore made up a larger percentage of the surviving females.

71. Acceptable responses include, but are not limited to:
Many of their mothers had no tusks, so they inherited that trait.
or Most of the surviving females had no tusks, so their offspring were more likely to inherit the trait from them.
or Tuskless females made up more than 50% of the population after the war.

Explanation: The increase in tuskless females after the war resulted in an increase in frequency of the tuskless gene within the population. More offspring would inherit the tuskless gene as noted by the increase from 6% to 33% of tuskless female offspring.

72. Acceptable responses include, but are not limited to:
Tuskless males would lose in mating battles and probably die.
or Since they are males, they fight other males for mates and would be more likely to be seriously injured and die.
or Females are not as likely to mate with tuskless males.
or In males, tusklessness may be lethal.

Explanation: Being tuskless may be a disadvantage for male elephants as they are unable to defend themselves during mating season and may not be attractive as a mate to female elephants. There is some speculation that the tuskless gene may be lethal for males as well.

Part D

73. 1 The heart rate is the dependent variable because it is the variable that changes as a result of the independent variable, different scary movie scenes, being manipulated.

74. 4 A hypothesis is a statement that attempts to explain an observable phenomenon. It provides the basis for scientific investigation. In this experiment, the effect of scary movie scenes on heart rates is being investigated.

75. 3 Solution *B* digested the cornstarch where it was swabbed. When exposed to starch indicating solution, the question mark was clear as there was no starch present unlike surrounding gel which turned blue. Solution *A* did not digest the starch and the swabbed question mark did not appear clear.

76. 2 Using the diagram, the warbler finch has a probing beak (white diagram section) and consumes insects (inner diagram section). The other finches in the chart are incorrectly matched with beaks and food.

77. Answer: Group *A*

Supporting statement:
Distilled water moves into cells and makes them swell up or even burst.
or Distilled water has a higher water concentration than the cytoplasm of red blood cells. Water will move into the cells and they will get larger.
or These are the cells that got bigger/burst.
or It is *A* because the cells in *B* shrank.

Explanation: Distilled water has 100% water concentration. When red blood cells, which have a lower water concentration, are placed into distilled water, water diffuses into the red blood cells. The red blood cells will swell and may even burst. Remember, that diffusion is the movement of molecules from a high concentration to lower concentration.

LIVING ENVIRONMENT

CONCEPTS, RELATIONSHIPS, AND QUESTIONS BY TOPIC REFERENCE

1. Cells are the basic unit of structure and can be different to perform many differentiated functions.

2. Organisms are classified based upon structural and evolutionary relationships.

3. All living organisms must carry out all life processes or functions in order to survive.

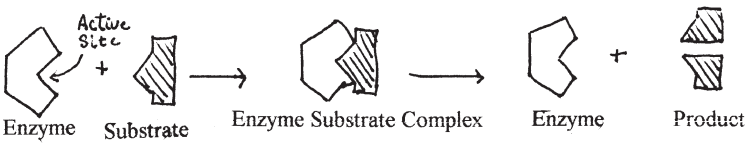
4. Homeostasis is the maintenance of internal balance within an organism.

5. Feedback mechanisms are a regulating action where levels of hormones, chemicals or physical features trigger a response or action that returns an organism back to normal conditions or homeostasis.

6. Organic compounds are composed of building blocks which are essential for living organisms. They include:
   Carbohydrates – composed of simple sugars
   Proteins – composed of amino acids
   Lipids –composed of fatty acids and glycerol

7. Indicators identify substances by changing color when in that substance presence. Indicators can be used to identify organic compounds such as glucose or starch.

8. Enzymes are organic catalysts that speed up a chemical reaction but are unchanged by that reaction.

9. 

10. Rates of enzyme activity can be influenced by temperature, pH and the amounts of enzyme or substrate.

11. Autotrophs produce organic molecules from inorganic materials, generally, through photosynthesis.

12. Heterotrophs must obtain pre-made organic molecules for nutrition.

13. Photosynthesis involves a process where light energy from the Sun is converted to chemical bond energy of organic compounds. Plants or autotrophs perform this process which is the base for the energy pyramid.

14. The cell membrane (plasma membrane) regulates homeostasis within a cell by selectively allowing materials in or out.

15. Active transport involves the use of energy to move materials from areas of low concentration to areas of higher concentration.

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